

place and enable Prof. Bütschli to give a decisive opinion upon many points on which authorities have hitherto differed. Many of the illustrations in the admirably engraved plates are also original.

We may perhaps remind our readers that it is to Prof. Bütschli that we owe the first important paper in the recent development of our knowledge of the karyokinetic figures of dividing cell-nuclei. It is his investigation which demonstrated the identity of the changes in the nuclei of Ciliate Infusoria with the curious fibrillation of normal tissue-cells when in course of division, and more than any others have given a wide basis to the recent generalisations on this subject.

Our author is not only extremely fair and scrupulous in citing all discoverable authorities for the facts which he sets forth as to the structure, &c., of Protozoa (our English microscopists of all ranks will find themselves cited and fairly considered), but he exhibits admirable judgment, temper, and caution in his treatment of vexed questions. He has wisely withheld his full discussion of the classification of the Radiolaria until such time as Haeckel's *Challenger* work on the group is published. In the meantime his analysis of the various forms of skeleton which occur in that group is a masterly essay on a very difficult subject.

With regard to the question of the chlorophyll corpuscles of some Protozoa—considered by Brandt as parasitic Algæ—we gather that Prof. Bütschli leans to the acceptance of that view; but we shall look for a more definite judgment from him in relation to that question when he has to discuss such forms as the Ciliata, *Stentor*, *Bursaria*, and *Ophrydium*.

It is noteworthy that Prof. Bütschli includes the Volvocina and the "Protococcus" forms in the Flagellata, being convinced of their relationship here in spite of their "holophytic" nutrition.

It would be impossible here to point out the numerous new views of importance which are advanced in Prof. Bütschli's work. It must be sufficient to say that the book is absolutely invaluable to every student of microscopic life, and is perhaps the most remarkable attempt yet made by a distinguished original observer to co-ordinate and render available for use the entire series of works of his predecessors in a large and important field of study.

E. R. LANKESTER

PHÆNOLOGY

Resultate der wichtigsten pflanzen-phänologischen Beobachtungen in Europa, nebst einer Frühlingskarte. Von Dr. H. Hoffmann, Professor der Botanik in Giessen. Anhang, Dr. Egon Ihne, *Die Norwegischen, Schwedischen, und Finnländischen Beobachtungen.* (Giessen: J. Ricker'sche Buchhandlung, 1885.)

THIS work, the results of forty years' labour, forms a most important contribution to the literature on the subject of phænology.

The work begins with an introduction, in which is explained the importance of phænological observations, particularly with regard to comparative climatology and biology. Then follows an investigation of the degree of accuracy to be obtained by this kind of observation, succeeded by a discussion as to how many years such

observations ought to be continued for obtaining useful and trustworthy information for comparative investigation. A table is then given of those plants and their phases which the author, after forty years' observations, thinks the most proper for adoption with a view to international reception. The number is fifty-three, and they are arranged according to the calendar, to facilitate observation; which system appears with regard to accuracy preferable to an alphabetical arrangement.

A short notice follows of the most important general results of the work with respect to climatology and biology, abstracted from the observations from the whole of Europe. At the end of the introduction the author points out the next tasks for phænological researchers.

The remainder of the book contains an alphabetical list of all phænological stations throughout Europe (about 2000), with the geographical situation and elevation above sea-level. Under each station are given in an alphabetical arrangement the mean dates of the simple phases known from the place, with the number of years of observation.

It is to be seen that from a great number of these but one or two years' observations have been published, whereas others extend to above thirty years. These dates are to be employed for comparing any single place with all the others. The mean dates are given as completely as possible, because such comparisons are the chief object of the author for publishing this work. They are extracted and calculated from a vast number of lists published in a great many periodicals and works of all nations.

With regard to spring flowers, the author himself has followed the plan of comparisons, giving under each station an indication of the number of days the single species open their flowers, sooner or later than at Giessen, the residence of the author, from which place, generally speaking, the most comprehensive observations have been published. In a "spring map" of Europe at the end of the book the results of these investigations are entered, by which the mean progress of spring through different countries may be seen at a glance.

OUR BOOK SHELF

Louis Pasteur, his Life and Labours. By his Son-in-Law. Translated from the French by Lady Claud Hamilton. (London: Longmans, Green, & Co., 1885.)

THE name of M. Pasteur, owing to his many brilliant and eminently practical discoveries, has been for some years so prominently before the general public that a popular and connected account of his life and labours cannot fail to be interesting and instructive reading to every educated member of the community. In this respect the present volume must be considered a signal success and a valuable addition to popular scientific literature. But the importance of the book reaches a step further, for it gives to the scientific world an authentic account of the development and progress of M. Pasteur's discoveries, since it is written by one who has been and is still living with M. Pasteur in the bonds of intimate friendship, and who has received his information directly from M. Pasteur himself. While to the general reader the achievement of a discovery is the only and great point of interest, to the scientific reader it is only one of many, the history of a discovery being one of them, and not the least important one, for it reveals methods and manner, and it gives us a true insight into the working of the

mind, more so than the contemplation of the actual results. Looking at the book in this sense, we must consider it of inestimable value to every worker in the same field of research.

The many and great researches of M. Pasteur—amongst which may be mentioned his discoveries that every one of the many kinds of fermentations depends on the growth and activity of a definite and specific microbe; his long-continued controversy and final refutation of the doctrine of spontaneous generation, his immensely practical discoveries on the silkworm diseases, on the attenuation of the virus of splenic fever and of hydrophobia are described with great lucidity and their history and progress rendered in a very spirited and fascinating manner. Reading the volume, one does not know what to admire more in M. Pasteur's life and labours—the way in which a problem is stated, worked, and solved in all its theoretical and practical bearings; the energy and perseverance with which he forces nature to yield up her secrets; the fertility and resources of his genius, or the ready way in which he goes to work to set at rest by direct experiment all objections and to remove possible sources of error. His is a truly grand life and his labours grander still!

The translator is to be congratulated on the admirable way in which she has fulfilled her task. Prof. Tyndall's preface forms an interesting and valuable part of the book.

E. KLEIN

The Microtometist's Vade-Mecum. A Handbook of the Methods of Microscopic Anatomy. By Arther Bolles Lee. (London: J. and A. Churchill, 1885.)

In the preface the author tells us that the aim of the book is to put into the hands of the instructed anatomist "a concise but complete account of all the methods that have been recommended as useful for the purpose of microscopic anatomy," and also "that it is to serve as a guide to the beginner." After a perusal of the book we venture to say that, although the book will prove useful, it is neither a concise, still less a complete, account of all the methods, nor will it serve as a guide to the beginner. As far as we can see, it is a collection of formulæ, published by various authors in various journals and archives, and particularly reported in the *Journal* of the Royal Microscopical Society. The formulæ are more or less promiscuously given, and without an attempt of intelligible selection. For many formulæ references to their authors are given, but in some places these references are incomplete, in others they are wrong, since methods discovered by one are ascribed to another. Nor can we see the use of describing a host of minute and sometimes quite insignificant modifications of a certain method, as A's, B's, C's, &c., method.

As regards the beginner, we venture to say that the book will fail to come up to the expectations of its author. What the author for this purpose ought to have done is to give us a list of ready methods which he himself has tried and found useful in the examination of the various tissues.

The important branch of the examination of living issues, the methods used for the application of reagents, heat, gases, electrical currents, &c., on fresh and living tissues are not included in the book; their treatment, and a few illustrations of apparatus used in microscopic technique, would prove a useful addition.

E. KLEIN

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Late Prof. Clifford's Kinetic

PROF. TAIT, in his notice of Clifford's "Common Sense of the Exact Sciences" (*NATURE*, vol. xxxii. p. 124) has brought

so prominently forward the statement made in Prof. Pearson's footnote—"the manuscript of the 'Kinetic' was left in a completed state," that I think it is fitting I should somewhat anticipate what will ultimately be stated when the manuscript in my hands has been printed. All the manuscript bearing upon the "Dynamic," after having, I think, passed under Mr. F. Pollock's eyes, was handed over to me, and with it Mrs. Clifford gave me, for use,¹ nine German text-books in case I should need them to fill up any gaps in the manuscript. It is needless to say that there have been "reasons" why this manuscript has not hitherto seen the light; suffice it now to say that the *continuous* portion has been received by Messrs. Macmillan, and the printing is to proceed forthwith. But of what does the *continuous* part consist? I have a draught before me of the work as originally contemplated by the author: Books i., ii., iii., form the "Kinematic"; Book iv., entitled "Forces," is broken up into ten or eleven sections. It is this portion which is *continuous*, and which takes up about forty pages of manuscript. Book v. was to treat of "Stresses;" Book vi., of "Heat;" and Book vii., of "Waves and Vibrations." Of these latter books I have only stray leaves here and there. It is said "Fools rush in where angels fear to tread." I certainly do not propose to try to supplement Clifford's work, but what I do propose is to get out all the *continuous* part in continuation as approximately as I can of the "Kinematic" and to relegate the odds and ends to an appendix. If any mathematician thinks some other course preferable, I shall be glad to let him see the "slips," and will hope to profit by his advice. I am in the receipt of letters from distinguished teachers which express a hope that the lectures I referred to (*NATURE*, vol. xxvii. p. 4) may see the light; but this point is still, I believe, under consideration.

R. TUCKER

University College School, June 13

Sky-Glows

A MAGNIFICENT display of red sky-glow has been seen here. The last observed was in September last (the 17th, the 27th, and the 28th), and only feeble ones have been noticed since up to June 11. At that date the sky glowed with a magnificent grayish pink on the whole of the northern horizon until 9 o'clock p.m. Yesterday the glow was still brighter, and at 9 15 p.m. it extended over the whole of the northern and north-eastern horizon. It was brighter than even last year, but acquired its maximum of brilliancy at a later hour than last summer.

Clairvaux-sur-Aube, France

P. K.

Flying Fish

AN excellent opportunity of observing the aerial means of propulsion in the flying fish was afforded me during a six days' calm lately when crossing the Bay of Bengal. This must be my excuse for again touching this subject. I watched day by day some hundreds rise under the bows of the ship. The water surface was a glassy calm. As each fish rose it spread its wings at once, apparently beating the surface with them two or three strokes before they steadied out. I say apparently, for it was not a definite beat so much as a struggle to rise. The tail which, of course, under water was in rapid motion, to escape from the ship, now gave ten or a dozen rapid beats, which could be counted by the ripples on the still surface, and the fish was off in aerial flight. As each fish lost the impetus of the first rise, which generally happened at about forty yards, the binoculars showed us the anal fins, which had till now been fully extended, drooping to feel the water. As soon as the surface was felt the tail was quickly introduced, and five or six smart strokes, also indicated by ripples, brought the impetus up again and carried the fish about another thirty yards, when another droop sent it on again, and so forth, some of the older fish travelling in this way 400 to 500 yards. The younger fish frequently fell awkwardly in this attempt to regain impetus. Where wails were running it requires a clever fish to gain impetus by a few judicious strokes on the crest of a wave, and many a fish tumbles over in the attempt.

I once saw a fish rise close to the ship's quarter, and it flew parallel with the ship, pursued below by a dolphin or bonito. The latter followed every sway of the flying fish, keeping almost under it. At the first dip of the tail the pursuer made a dart forward, but missed it, and again dogged its prey by keeping

¹ These books are to be presented to University College Library after I have done with them.